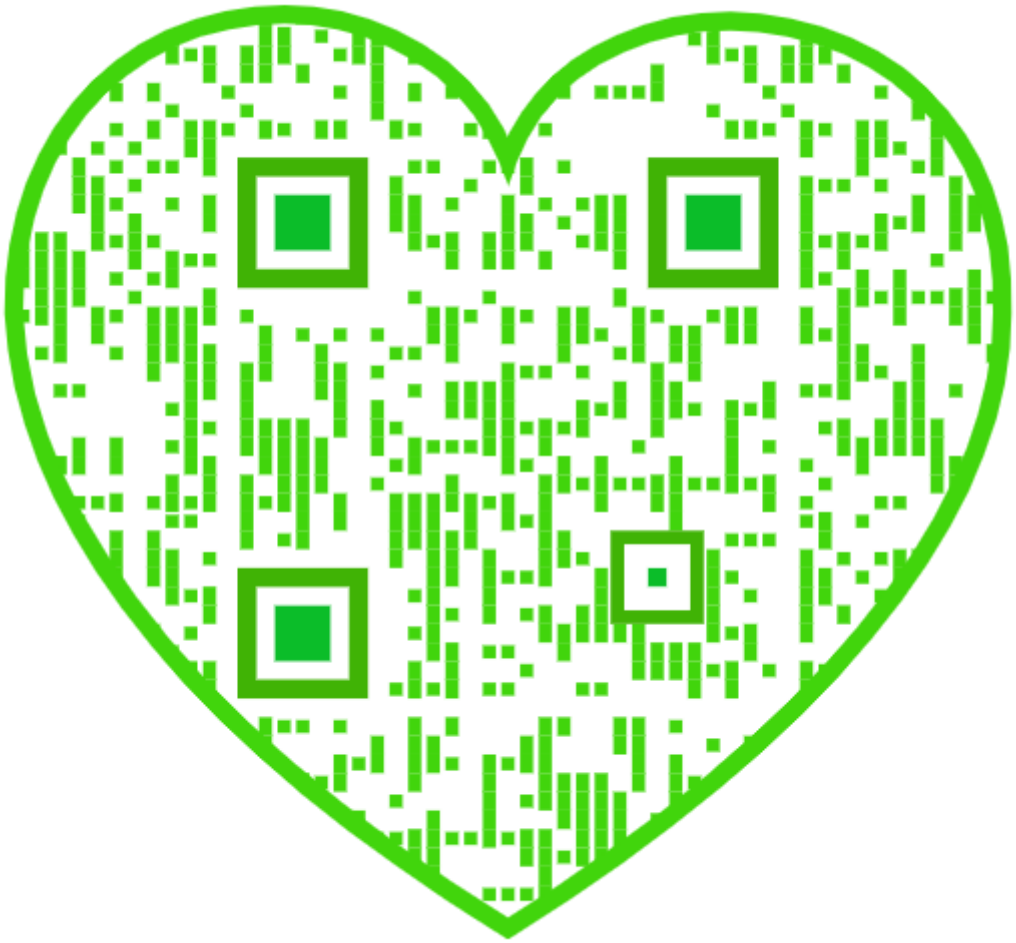

PINE TREE TREASURES

COLLECTING THE GUM OR DIP

UNITED STATES DEPARTMENT OF AGRICULTURE
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To-day there probably is no more picturesque industry in America than that of manufacturing turpentine and other commodities known as naval stores. It is an industry which wrests from the pine forests of the South products of great value which are used in almost every country of the world. Pine-tree gum, otherwise known as oleoresin, is the tree product. From it are made the turpentine and rosin of commerce. History tells us that in ancient times these commodities were of great importance to commerce, and they are no less important to-day. The pine woods that yield oleoresin are a natural resource that must be fostered and protected.

Much information about naval stores has been developed from research work of the Forest Service and the Bureau of Chemistry and Soils in the United States Department of Agriculture. The Forest Service has made extensive studies of the best methods of collecting the crude gum and of handling the trees for maximum yield, while research in the extraction of the turpentine and rosin and in the marketing and utilization of these products has been conducted by the Bureau of Chemistry and Soils. This information has been published in the technical bulletins of the department, and those who are interested in a complete study of the subject of naval stores are referred to these publications. The Food and Drug Administration of the Department of Agriculture, which is charged with the administration of the naval stores act, has also published information about the marketing of these products. The purpose of this publication is to present in an elementary and popular way a simple story of this naval-stores industry, in order to impress the public mind with the value of this great natural resource and with the need for renewing and protecting the pine forests that produce it.

PINE-TREE TREASURES

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When a chip is cut from a longleaf or slash pine, tree gum, or oleoresin, oozes from the cut. This gum, either in its raw state or cooked into pitch, and the tar and pitch made from heating resinous wood—lightwood—in kilns, received the name naval stores at a time when these products were used in building and repairing ships and in the fixing of sails and tackle. The name still clings, although present-day naval stores are turpentine and rosin, products of the distillation of the pine-tree gum or oleoresin, and are used in the manufacture of articles quite unrelated to ships and shipbuilding.

The manufacture of turpentine and rosin has become a large and important industry. The longleaf and slash pines of the South are the trees from which the great bulk of naval stores is produced. The conservation of these treasure trees and their protection from fire and other destructive agencies are necessary to the welfare and permanence of this important business.

IN EARLY TIMES

The production of naval stores has always been a picturesque industry. It is older than the lumber industry, and its history reaches back to days, many centuries before Christ, when the natives of Asia manufactured pitches and oils from the gum, or resin, of the trees which grew on the shores of the Mediterranean Sea.

ANCIENT METHODS AND USES

In the early days, the gum was gathered, put into pots, and cooked down to a thick mass, and while it was cooking, fleecy sheepskins were stretched over the pots to catch the rising vapors of oil distilled out of the resin. This oil was recovered by wringing out the fleeces.

The oil recovered in this way was used in some of the arts and industries. One of its uses was in the manufacture of the age-enduring

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mummy varnish. The sticky mass left in the pot was pitch. It is recorded in Genesis that in building the ark, Noah was commanded to "pitch it within and without with pitch."

INFANT INDUSTRY IN COLONIAL TIMES

In this country, the collection of crude resin from pines and the making of pitch and tar date back to the early sixteen hundreds. However, the first records of importance are of a century later. At that time, the gum was gathered from the pines of Virginia and North Carolina, placed in clumsy pots and kettles, and heated until only a pitchy mass remained. This pitch was strained and used in caulking the seams of wooden ships.

GROWTH OF THE INDUSTRY

With the growth of the colonies, a small naval-stores industry grew up along the Middle Atlantic coast and slowly extended south. The methods and equipment were still very primitive, and there was little thought of improvement or expansion of the business. Later, however, the resin or gum obtained from the trees was shipped to distilleries located at the leading markets, such as Philadelphia, New York, and London, where it was cooked in closed iron retorts. Here a portion of the volatile oils, hitherto wasted, was condensed and saved. This product, called "spirits of turpentine," or "oil of turpentine," was used extensively for lighting and as a solvent, or thinner, for other materials. In 1834, the copper kettle and condensing worm of the kind used in distilling malt were first used for distilling crude resin from the pine trees. Practically the same form of still is in use to-day. By 1850, the world was finding new uses for both turpentine and rosin which constantly increased the demand, causing a steady growth of the industry. To-day, about two-thirds of the world's naval stores are produced in the southern United States, and approximately $50,000,000 are invested in the business.

MAKING THE INDUSTRY PERMANENT

In order to make the industry permanent, provision must be made to insure a continuous crop of treasure trees.

The longleaf pine and the slash pine (figs. 1 and 2), both forest trees of great economic importance, from which two crops, naval stores and timber, are derived.

The natural range of the longleaf pine extends from southeastern Virginia southward over the Atlantic and Gulf coastal plain to Florida and westward to eastern Texas. The range of the slash pine extends from about Charleston, S. C., westward through southern Georgia, Alabama, Mississippi, and southeastern Louisiana to the Mississippi River, and southward nearly to the southern extremity of Florida.

Both kinds of trees come from seed borne in cones. The young trees never spring from the roots, as do many hardwood trees. When the cones mature and open, the seeds wing their way to the ground, and if given a chance germinate, and start a new crop of trees. (Fig. 3, A.) It is, therefore, important at the time of cutting the trees

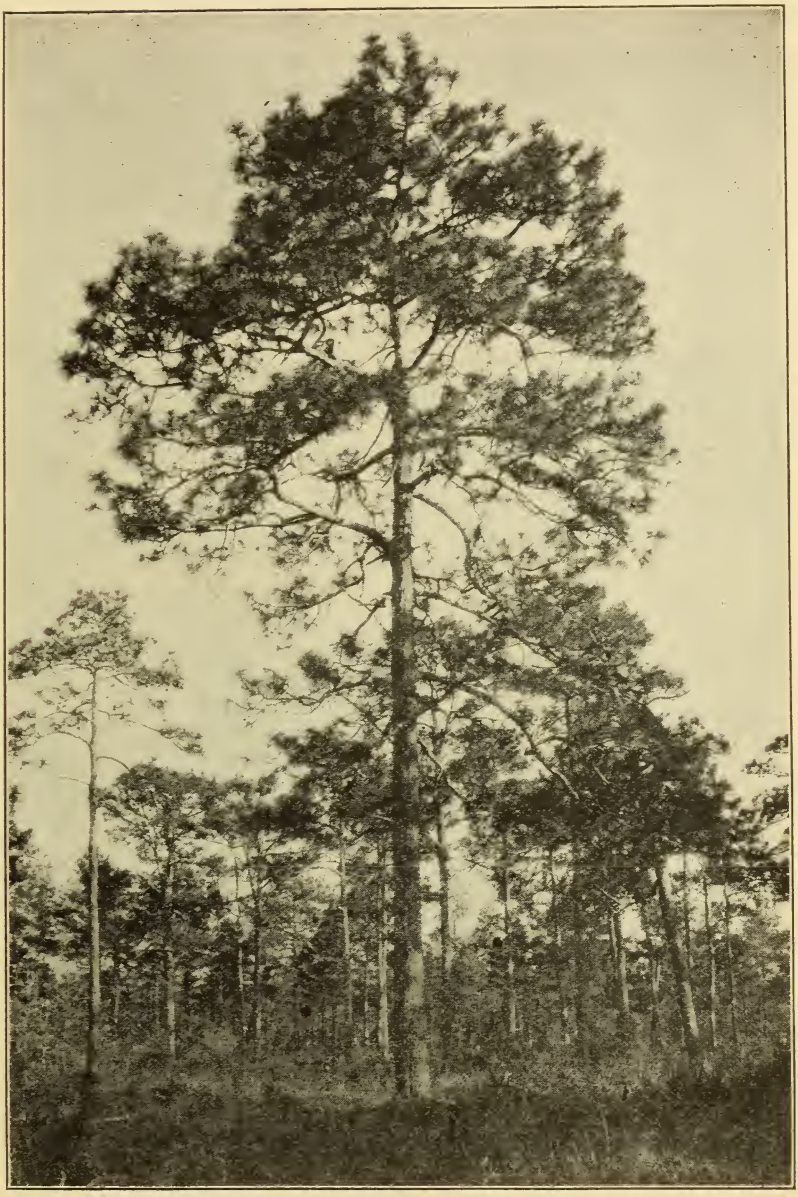

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FIGURE 1.—A stately representative of the longleaf pine treasure trees and an ideal mother tree

for lumber to leave a few good seed trees per acre. If the seed trees are left and the land protected from fire and razorback hogs, nature will do its part to bring back the treasure trees by furnishing and sowing a bountiful supply of seed. (Fig. 3, B.)

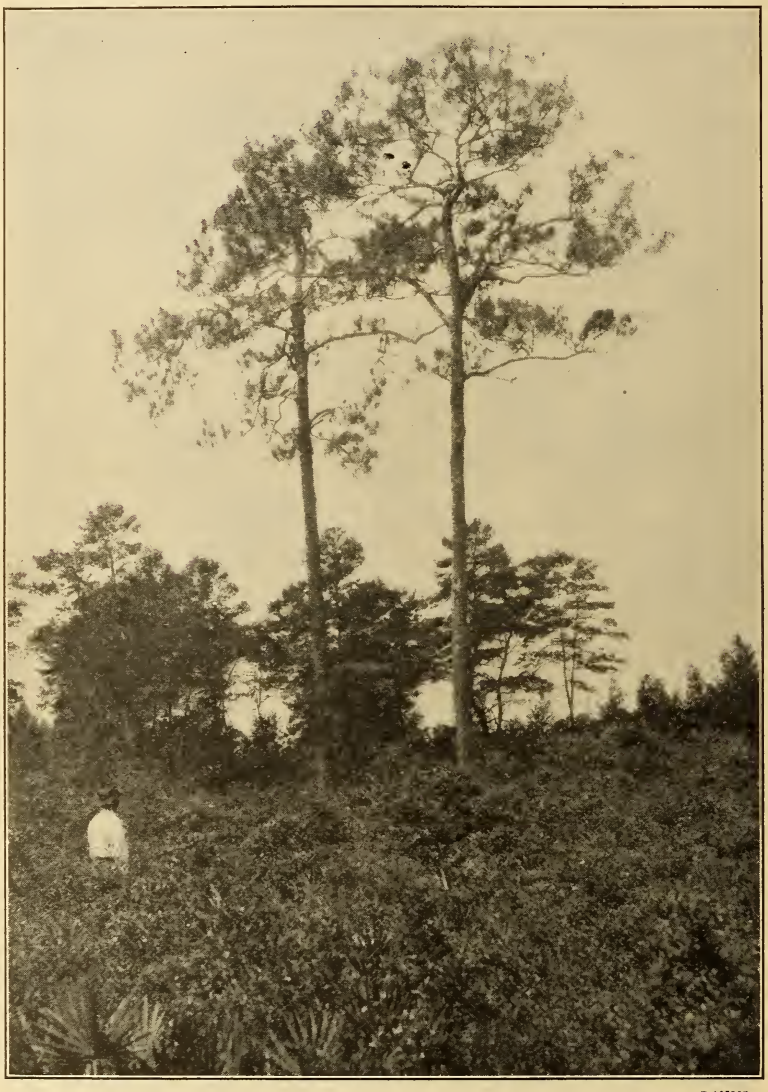

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FIGURE 2.—Slash pines; other important members of the treasure-tree family

Wasteful and destructive methods of turpentining and logging have always greatly reduced the production of these two important crops. Until 20 years ago, the pine trees were "boxed," that is, a deep wedge-shaped hole was cut into the base of the tree to catch

the gum. This practice made the collection of the gum difficult. It also increased tremendously the damage to the trees, and in many instances so weakened the smaller ones that they became an easy prey to windstorms. (Fig. 4, A.)

FIGURE 3.—A, The seed-tree method—nature's way of providing future treasure trees; B, the grown-up treasure trees and three of their gifts—turpentine, timber, and pine straw

The native razorback or piney-woods hog is one of the greatest enemies of the young longleaf pine trees, perhaps second only to fire. (Figs. 4, B, 4, C, and 4, D.) It eats large quantities of the seed and destroys vast numbers of the baby trees, rooting them up to feast on the thick, juicy bark of the taproots. Where these hogs are present, the baby trees have to be protected with hog-proof fences in order to establish a new crop.

It has become increasingly apparent to leaders in the industry, as well as to the Government, that the permanent welfare of the naval-stores industry demands less wasteful methods. With this in mind, the Forest Service of the Department of Agriculture for the past 15 years has been trying to determine and demonstrate, for the

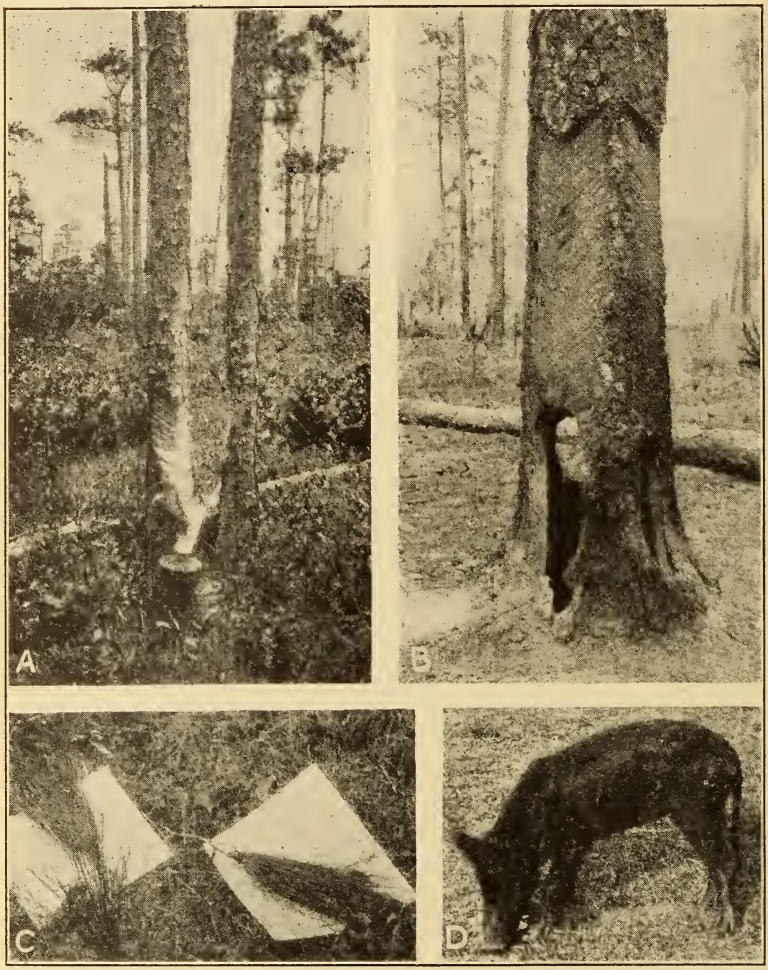

FIGURE 4.—Figuratively "killing the goose that lays the golden egg": A, Chipped almost in two. Not a leg left to stand on. Victim of first gale. B, Fire takes a heavy toll of the treasure trees. C, Millions of the baby trees are destroyed every year. D, The "piney-woods rooter" (razorback hog). He and his tribe "root 'em up"

benefit of the industry, methods of turpentining that would yield the best returns and sustain the industry permanently. In the studies made on the Choctawhatchee National Forest in Florida for this purpose, the organized naval-stores producers have cooperated heartily.

MODERN INDUSTRIAL USES

IMPORTANT USES OF TURPENTINE

The importance of the treasure trees becomes apparent when the multitude of articles in everyday use into which turpentine enters is considered. Because of its fitness for so many special uses no wholly satisfactory single substitute has yet been found. As a thinner of oil varnishes and gloss paints, for example, gum spirits of turpentine has no superior and is preferred by most painters for the purpose. When it is understood that in the United States alone a billion dollars is invested in the paint industry, with a working force of 100,000 men, some idea may be formed of the importance of the treasure trees for the supply of turpentine alone. There are many other important uses for turpentine. It may be used as an ingredient of printing inks and for color-printing processes in lithography; a preventive for "bleeding" in the manufacture of cotton and woolen print goods; in the manufacture of patent leathers; a thinner for waxes in shoe and leather polishes, floor polishes, and furniture polishes; a solvent for waterproofing compositions, and for rubber and similar substances; an ingredient in belting greases; an insecticide; an ingredient in laundry glosses, in washing preparations, in stove polishes, and in sealing wax; a raw material for producing synthetic camphor, and indirectly celluloid, explosives, fireworks, and medicines; for pharmaceutical purposes, including disinfectants, liniments, poultices, medicated soaps, ointments, and internal remedies.

Spirits of turpentine long has held a place of honor among the homely remedies in the family medicine chest.

USES OF ROSIN

Modern chemistry has developed a number of uses for naval stores, and they have become essentials in some industries. Rosin is used in the manufacture of soap and for the surfacing of paper suitable for writing and printing. It is used in the manufacture of rosin oils, varnishes, and paint dryers, in waterproofing compounds, in roofing materials, in leather dressings and shoe polishes, in sealing waxes, in the manufacture of linoleum and oil cloth, in floor waxes and polishes, in printing inks, and for many other important purposes. Rosin also enters into the making of many ointments, plasters, disinfecting compounds, and is used for other pharmaceutical purposes.

IMPROVED PRACTICES BEING ADOPTED

A more economical treatment of the treasure trees by the use of improved methods of turpentining, together with protection from fire, is doing much to add years of life to the trees and to increase the amount of their products. But come into the woods and follow step by step the production of turpentine and rosin from the tree to the barrels of the finished product and see some of the improved methods. (Fig. 5.)

TREASURE TREES THAT WEAR APRONS

A woods rider or superintendent selects his stand of treasure trees, and with a crew of 15 men works from January to March putting

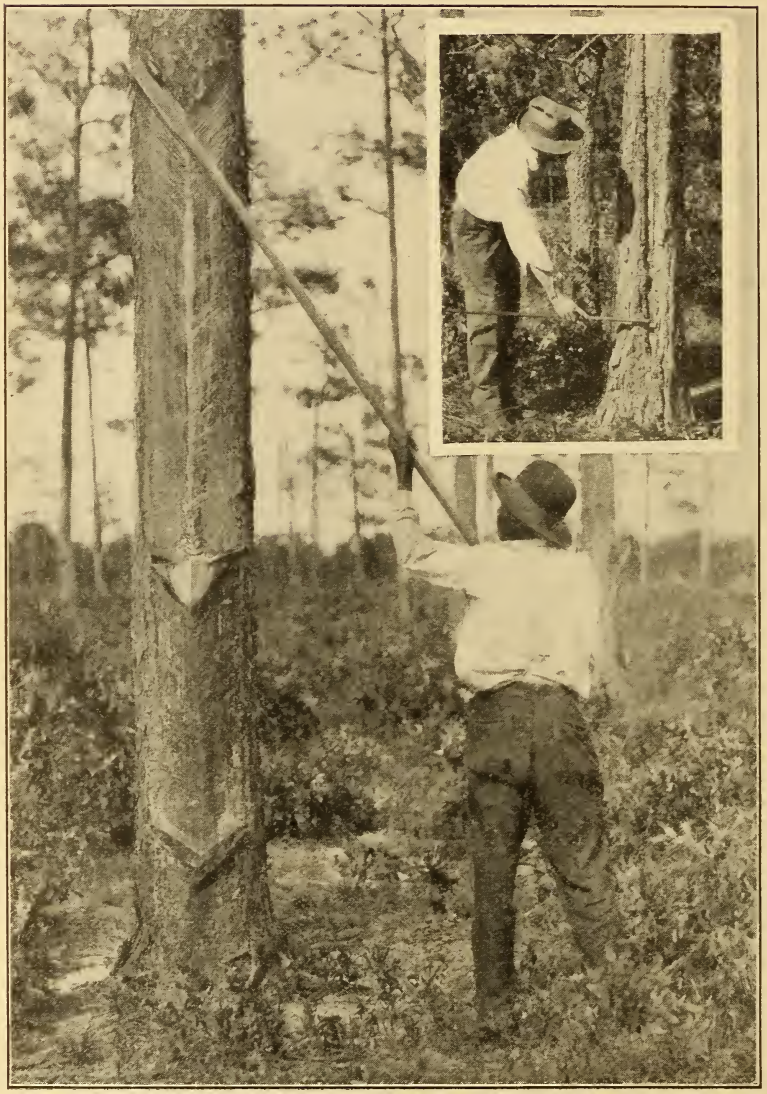

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FIGURE 5.—Improved methods insure many successive crops. This clearly shows the splendid service of trees in production. Where care is used one face can be profitably turpentined for many years. During the tree's rest period rolls of healing tissue close over the scars of the first face while they make ready to give their next rich crop of gum. The inset shows how such faces heal over

a small cup and side gutters called "aprons" at the base of the trees to be worked. Small trees under 10 inches in diameter are not cupped, unless it is desired to kill them out in order to thin a stand for future careful working.

TREASURE TREES' FACES

Usually in March, after the cups and aprons are put on, "chippers" start their rounds, going briskly from tree to tree cutting with a peculiar chipping tool, called a hack, a wound or "streak" just above the cup. (Fig. 6, A.) This chipping takes but a few strokes of the hack to make a wide V-shaped cut through the bark and about one-half inch deep into the wood. One chipper can make about 10,000 streaks each week. Once every week for from 28 to 32 weeks, the chipper makes a new cut or streak through the bark, each new streak being just above the one made the previous week, until by the end of October there is a scarred surface or "face" on the trees, varying from 6 inches to 15 inches wide, according to the size of the tree, and as high as 16 inches. The face may be extended during the following seasons to a height of 6 or 8 feet. Usually two faces are not put on trees under 16 inches in diameter, and on all 2-faced trees, strips of bark at least 4 to 6 inches wide are carefully maintained between faces. (Fig. 6, B.) Trees properly turpentined seldom blow down, because the tins, called gutters or aprons, which lead to the cups are not driven deeply into the wood. Sharp tools are used, and smooth, regular work is insisted upon.

By these improved practices, the power of the tree to produce gum is conserved. When young trees are turpentined for a number of years, considerable amounts of new tissue are formed especially adapted to produce extra quantities of gum. Nature builds a highly efficient factory from which the wise operator can receive large returns. To secure sustained yields of gum, only enough wood should be cut away at each chipping to open the closed gum passages and remove the dead gum-producing cells at the surface of the wound. A very thin chip will accomplish this. Narrow chipping, moreover, lengthens the time that a face can be worked profitably.

GATHERING THE GUM

From the freshly chipped tree the gum exudes from the surface of the streak, drop by drop, and slowly finds its way into the cup. When the gum first exudes from the tree, it is as clear and almost as colorless as water. After it has been exposed to the air it becomes opaque, because of the separation of the rosin acid crystals. When the gum is flowing and the season's operation is in full swing, the forest is filled with the resinous smell of the gum—literally the concentrated perfume of the piney woods.

As the gum fills the cups suspended from the trees, it is dipped out, placed in barrels, and hauled to the still. (Fig. 6, C and D.)

THE TURPENTINE STILL

Convenient to some shipping point is the still, flanked by its storage tanks for turpentine and its barrel-filled rosin yards. (Figs. 7 and 8.) The still consists of a big copper kettle set in brick work

with a gooseneck cap and worm similar to that in stills for making alcohol. The worm passes through a tank filled with cold water and ends above a barrel or tank arranged to receive the distilled

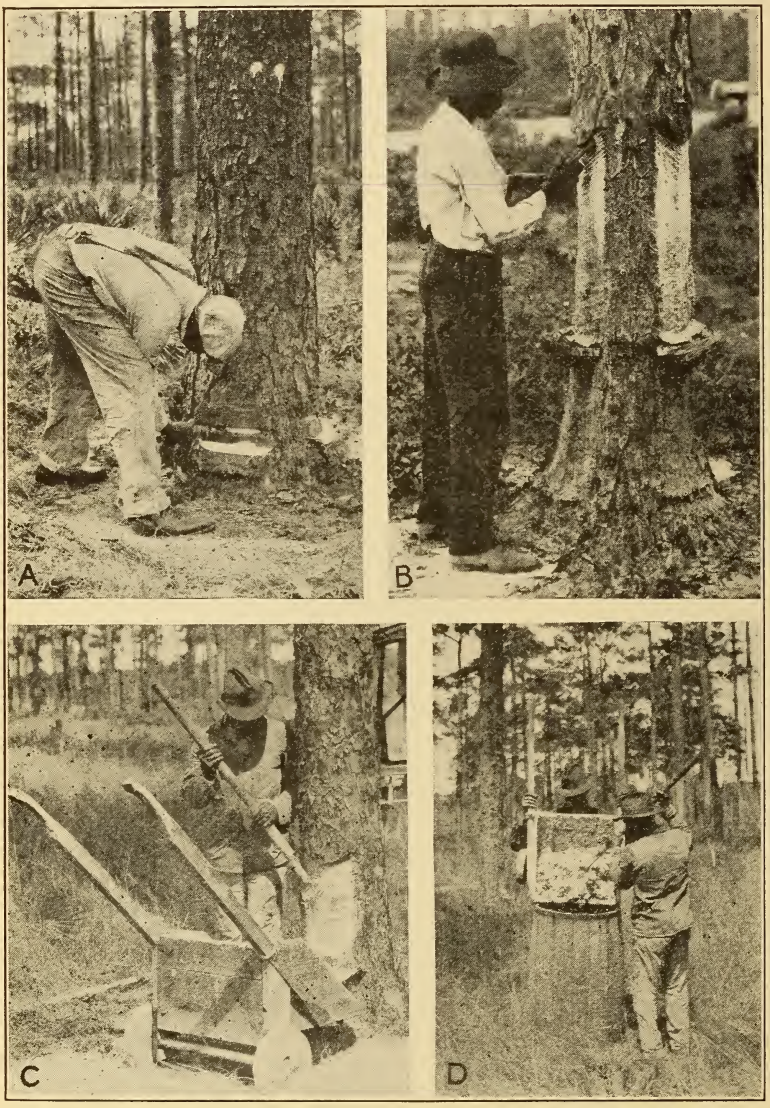

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FIGURE 6.—The treasure trees give up their treasures: A, With her apron on and cup hung the first streak is made; B, the strip of bark left between the faces allows the tree to live and grow; C, D, removing the dried gum, called "scrape," from the faces and dumping it into barrels to haul to the still

spirits. Beneath the kettle or still is a furnace. When the gum in the still is warmed up until it becomes liquid, the still is uncapped and most of the chips and pine needles, which ordinarily are mixed

in with the gum, are skimmed off. The cap is then replaced, and the stilling is continued. As the water and spirits of turpentine are boiled off, additional water in a constant stream is introduced into the still. When most of the turpentine has been stilled off, the stiller takes a sample of the condensed steam and turpentine and when the proportion of turpentine to the water is no more than 5 per cent, it is considered that the charge is cooked. (Fig. 9.) Then the water is shut off and the remaining water in the gum is cooked off. Ordinarily, it takes about 10 barrels of the raw gum to make a "charge" or fill the still, which produces about 2 barrels of spirits of turpentine, with 6 or 7 barrels of rosin remaining in the still.

THE END OF THE PROCESS

When the end of the distillation is reached, the still is uncapped and the stiller watches and waits for the foam to settle, for when

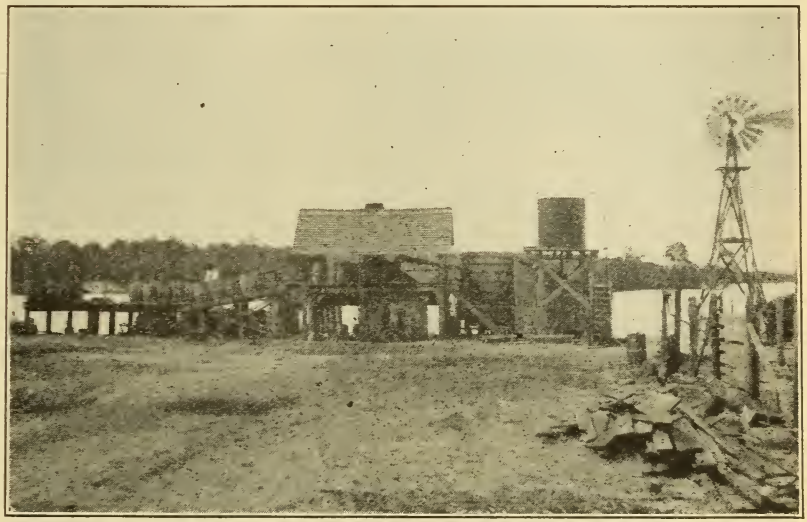

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FIGURE 7.—The still where the gum is converted into turpentine and rosin

the foam has settled, all traces of water have passed away. When that stage is reached, a tail gate in the retort is opened, and the intensely hot liquid rosin pours out through a set of screens. The top screen removes the chips and large pieces of bark which were not skimmed off at the beginning of distillation. This screen has a very coarse mesh. The second screen, made of very fine mesh copper screening material, strains out the very small pieces of bark and large sand. The third screen has on it cotton batting which strains out very small impurities such as fine sand. From the screen the rosin runs into a vat from which it is dipped into barrels, in which after cooling, hardening, and grading, the rosin is shipped to market.

Naturally a substantial portion of the hot rosin sticks to the refuse and cotton batting. This refuse from the bottom strainer

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FIGURE 8.—Emptying the barrel of gum into the still

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FIGURE 9.—The stiller with his test glass takes a sample of the condensed steam and turpentine

is known as batting dross, and from the middle strainer as strainer dross. To-day especially adapted refineries purchase this dross from which the rosin is recovered. It is also sold to lampblack factories. The chips of wood skimmed from the boiling gum are used locally for kindling.

The quality of both the turpentine and the rosin depends on the care and skill which mark every step from the treasure tree to the shipping container. To make high-grade turpentine and rosin, the gum has to be free from pine needles, chips, trash, and dirt. Then, too, the heat has to be regulated with great accuracy to produce the best results, for if the gum gets too hot, it is often discolored through scorching of the chips and wood included in the charge. Rosin

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FIGURE 10.—Barrels and barrels of the finished products ready for shipment to the world's ports

varies in color from black to pale lemon yellow, and the grades are based not only on color but on clarity, the palest, clearest grades bringing the highest price.

JUST LIKE DIGGING TREASURE

Now look at some treasure trees which have been turpentined for years. These trees are healthy and show rolls of healing tissue closing over the scars of the first faces. These trees will be rested a number of years and then worked with another face or "back-cup."

Now comes the last chapter of the story. The little logging train puffs by, drawing two tank cars of turpentine bound for the shipping point and several box cars filled with barrels of rosin. (Fig. 10.) Following are the cars of saw logs, showing the old turpentined faces on the butts.

Modern methods of turpentining do not affect the quality of lumber that a tree will produce. In the old days, the forests were seriously damaged by haphazard methods of the operators who often destroyed a stand of timber by working trees too small to undergo turpentining, or by working them too hard. Then, too, fire was a great menace to the timber which had been worked and left standing. Thus fires and overwork combined have killed great numbers of the treasure trees.

The number of years during which a tree can be worked for turpentine depends largely upon its size when first chipped. The treasure trees, like school children, need a vacation, and will yield the most in naval stores, and often in timber, if the growing trees are worked two or three times, one face each time, with a rest between.

When a treasure tree is properly turpentined, its life is not appreciably shortened, nor is its normal growth more than slightly retarded. But using wasteful and destructive methods is much like killing the famous goose that laid the golden egg.

WHAT WE HAVE LEARNED

Not to work trees that are too small. The larger the tree, the greater the yield. A good rule is not to work them until they are at least 10 inches in diameter breast high, unless the trees are crowded and need thinning.

To work only one face on trees less than 15 inches in diameter, and never more than two faces on any tree.

To use the cup method. Under no conditions to use the old wasteful box method.

That it is essential not to make deep cuts for inserting tins.

Not to cut the streaks too deep or go up the tree too fast. Three-quarters of an inch is almost too deep for second-growth slash pine stands occurring in crowded conditions. A No. 0 hack is usually better than a larger one.

To hang the cups as low as possible to prolong the working life of faces.

To cut no face more than 14 inches in width and that no face should exceed in width one-third of the bark circumference.

To leave at least 4 inches of living wood (bark) between the faces on all trees.

These methods are more profitable than the heavy working for turpentine.

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